Cruise Report - Monterey Bay Fill-in (PRC 8394)
U.S. Geological Survey Research Cruise
Gaviota to Point Sal, California
July 14-August 2, 2014

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Summary

In July, 2014, the Pacific Coastal and Marine Science Center of the U.S. Geological Survey (USGS) conducted geophysical research collecting high-resolution seismic-reflection and marine-magnetics data offshore central California from Gaviota on the southeast to Point Sal on the north. The purpose of these studies was to image the uppermost few hundred meters of sub-bottom sediments in order to map sediment thickness, inform habitat and geologic maps, and accurately locate offshore geologic structures such as earthquake faults. The work is a contribution to the California Seafloor Mapping Program. The seismic-reflection data acquisition technique utilizes sound sources towed behind the research vessel, generating discreet sound impulses that travel through the water column and reflect off the seafloor and sub-bottom geologic layers. The reflected sound energy is recorded by a towed array of hydrophones and these records are digitally processed to produce image profiles.

The survey area includes both state and federal waters (see map). For work in State Waters, USGS obtained permits from the California State Lands Commission and the California Department of Fish and Wildlife (for work in Marine Protected Areas).

Marine Mammal Mitigation

A primary requirement of the permits is that trained marine mammal observers (MMOs) be on board the research vessel during data acquisition operations to record all marine mammal sightings and ensure that the seismic reflection sound source is shut down whenever a marine mammal enters within a specified radius (130 m) around the sound source. The USGS sound source used for this survey was a 500 joule minisparker, fired at mostly 1/2 second shot intervals. The source signal frequency bandwith for this system ranges from about 200 to 1600 Hz. Boat speed during acquisition of seismic data was typically in the range of 4 to 5 nautical miles per hour. Soft start techniques were used to bring the minisparker on line at the beginning of each operational day and after shut downs for marine mammals

Observations

The research cruise (USGS cruise ID SW-632-14-SC) took place aboard the *RV* Shearwater, operated by NOAA Channel Islands National Marine Sanctuary, between July 19 and July 31, 2014. Participating trained marine mammal observers (MMO's) included Sam Johnson, Jeffrey Beeson, Stephen Hartwell, Alicia Balster-Gee, and James Conrad. The sign-in sheet for MMO's, which includes descriptions of weather and other marine environmental variables, is included in this report as Appendix A. During the survey, 190 observations of marine mammals were made and recorded in Table 1. Observations were primarily of California sea lions and common dolphins, with far fewer observations of humpback whales, sea otters, and Rizzo's dolphins. Locations of individual observations are listed on the spreadsheet (Table 2) and shown in Figure 1, as are the ship locations at the time of observations (not the position of the mammal in the water). Of the 190 observations, 129 were made in California's State Waters and 61 were made farther offshore in federal waters. Fourteen of the observations were made while the boat was in transit and not collecting data. During the survey, our seismic-reflection acquisition system was shut down 65 times due to proximity to marine mammals.

Environmental Conditions

The daily environmental conditions are provided in the MMO log in forms in Appendix A

Vessel Fueling

During the cruise, the boat refueled in Santa Barbara Harbor on 7/23 and in Port San Luis on 7/28. There was no cross vessel fueling of the vessel.

Exhibit H

A fully executed Exhibit H for this survey is provided in Appendix B.

Table 1. Marine Mammal Observations

Log Entry	Date	Time (GMT)	Latitude	Longitude	Species	Number	Distance (m)	Behavior	Comment
MO1	19-Jul	23:53:13	34.4068	-120.19615	Common dolphins	>100	10	Foraging/playing	Shutdown
MO2	20-Jul	15:47:12	34.3804	-120.41770	California Sea Lion	1	70	Swimming	Shutdown
MO3	20-Jul	16:28:06	34.4083	-120.42513	California Sea Lion	1	50	Jumping	Shutdown
MO4	20-Jul	16:01	34.4275	-120.41657	Otter	1	200	Playing, foraging	
MO5	20-Jul	16:47:03	34.4373	-120.41204	California Sea Lion	1	600	Staying near fishing boat	
MO6	20-Jul	16:50:26	34.4407	-120.41379	California Sea Lion	3	400	Jumping/playful	
MO7	20-Jul								no sighting (MO7 skipped in log)
MO8	20-Jul	17:05:39	34.4291	-120.42789	Common dolphins	5	1000	Jumping	
MO9	20-Jul	17:19:05	34.4121	-120.43503	California Sea Lion	1	250	Showed head + dove	
MO10	20-Jul	17:38:55	34.3854	-120.44702	Humpback	1	1500	Breached - repeatedly	
MO11	20-Jul	18:34:46	34.4454	-120.43974	California Sea Lion	8	150	Sitting on buoy	In transit (not collecting data)
MO12	20-Jul	18:38:30	34.4422	-120.44444	Sea Otter	1	200	Foraging in kelp	In transit (not collecting data)
MO13	20-Jul	18:38:49	34.4418	-120.44442	California Sea Lion	3	100	Jumping/playful	In transit (not collecting data)
MO14	20-Jul	19:23:28	34.3855	-120.47239	California Sea Lion	1	90	Thermoregulating	In transit (not collecting data)
MO15									no sighting (M15 skipped in log)
MO16									no sighting (M16 skipped in log)
MO17	20-Jul	19:26:58	34.3872	-120.47761	California Sea Lion	1	100	Thermoregulating	In transit (not collecting data)
MO18	20-Jul	19:54:08	34.4189	-120.46648	Common dolphins	lots	800	Swimming	
MO19	20-Jul	20:52:34	34.4017	-120.48550	Common dolphins	lots	2000	Swimming	
MO20	20-Jul	21:00:55	34.3923	-120.49126	California Sea Lion	1	160	Swimming	
MO21	20-Jul	21:30:17	34.425	-120.48922	California Sea Lion	1	135	Swimming	
MO22	20-Jul	22:10:59	34.439	-120.49216	Common dolphins	3	170	Swimming	
MO23	20-Jul	22:41:06	34.4087	-120.51823	Common dolphins	6	100	Swimming	Shutdown - ended line prematurely
MO24	20-Jul	22:56:04	34.4223	-120.51649	Common dolphins	3	750	Swimming	
MO25	20-Jul	23:09:24	34.4354	-120.50724	Common dolphins	5	300	Swimming	
MO26	20-Jul	23:14:40	34.4405	-120.50338	Common dolphins	5	50	Swimming	Shutdown
MO27	20-Jul	23:18:50	34.4448	-120.50044	Common dolphins	2	250	Swimming	
MO28	20-Jul	23:22:29	34.4486	-120.49788	Common dolphins	30	1000	Swimming	
MO29	20-Jul	23:30:38	34.4564	-120.49224	California Sea Lion	1	200	Swimming	
MO30	21-Jul	0:02:42	34.4683	-120.49614	Common dolphins	lots	400	Jumping/playful	
MO31	21-Jul	0:39:22	34.4276	-120.52452	Humpback	1	1000	Spout	Whale identified as Humback based on spout
MO32	21-Jul	0:49:48	34.4164	-120.53209	Humpback + Common dolphins	1 + lots	1000	Foraging	Maybe same whale as from MMO 31
MO33	21-Jul	1:12:52	34.436	-120.53164	Common dolphins	lots	80	Foraging	Shutdown
MO34	21-Jul	1:43:25	34.4664	-120.51011	California Sea Lion	1	150	Foraging	
MO35	21-Jul	1:55:33	34.4786	-120.50154	California Sea Lion	1	130	Swimming	
MO36	21-Jul	2:02:16	34.4852	-120.49868	California Sea Lion	1	140	Swimming	
MO37	21-Jul	13:33:49	34.4875	-120.52052	Otter	1	300	Swimming	
MO38	21-Jul	14:15:12	34.4938	-120.52862	California Sea Lion	1	110	Swimming	Outside exclusion zone before shutdown possible
MO39	21-Jul	14:23:31	34.4854	-120.53450	Common dolphins	10-15	900	Jumping	
MO40	21-Jul	15:23:20	34.4777	-120.55312	California Sea Lion	1	400	Swimming	
MO41	21-Jul	15:49:09	34.5081	-120.53222	California Sea Lion	1	125	Swimming	Outside exclusion zone before shutdown possible
MO42	21-Jul	16:03:32	34.5253	-120.53083	California Sea Lion	2	350	Jumping	
MO43	21-Jul	17:41:06	34.5312	-120.54044	California Sea Lion	1	250	Diving	
MO44	21-Jul	17:43:17	34.5338	-120.54238	California Sea Lion	1	180	Diving	
MO45	21-Jul	17:49:22	34.5307	-120.55260	California Sea Lion	1	300	Jumping/Diving	
MO46	21-Jul	19:49:11	34.5166	-120.58824	California Sea Lion	1	50	Jumping/Diving	Shutdown
MO47	21-Jul	19:54:03	34.5112	-120.59175	Humpback	2	5000	Spouting + fluke	
MO48	21-Jul	19:58:42	34.5063	-120.59529	California Sea Lion	1	200	Swimming	
MO49	21-Jul	20:04:38	34.5005	-120.59957	California Sea Lion	2	150	Swimming	
MO50	21-Jul	20:24:03	34.5053	-120.60850	California Sea Lion	1	400	Swimming	
MO51	21-Jul	20:48:42	34.5339	-120.58815	California Sea Lion	1	300	Jumping/playful	
MO52	21-Jul	21:10:47	34.5385	-120.59789	California Sea Lion	1	110	Swimming	Outside exclusion zone before shutdown possible
MO53	21-Jul	21:43:52	34.5029	-120.62309	California Sea Lion	1	140	Swimming	
MO54	21-Jul	22:28:24	34.5328	-120.61452	California Sea Lion	1	160	Swimming	
MO55	21-Jul	23:22:23	34.5072	-120.64532	California Sea Lion	1	30	Jumping	In transit (not collecting data)
MO56	22-Jul	0:06:03	34.5181	-120.64903	California Sea Lion	4	80-120	Swimming	Shutdown
MO57	22-Jul	0:11:52	34.5242	-120.64468	California Sea Lion	1	200	Swimming/jumping	
MO58	22-Jul	0:15:43	34.5284	-120.64179	California Sea Lion	5	400	Swimming/jumping	
MO59	22-Jul	1:20:43	34.5187	-120.68411	California Sea Lion	1	200	Swimming/jumping	
MO60	22-Jul	1:25:56	34.5147	-120.69050	California Sea Lion	1	300	Swimming/jumping	
MO61	22-Jul	1:57:13	34.4976	-120.70476	California Sea Lion	1	400	Swimming	
MO62	22-Jul	13:18:24	34.5221	-120.65907	California Sea Lion	5	100	Swimming/jumping	Shutdown
MO63	22-Jul	15:37:18	34.5368	-120.70954	Common dolphins	6-10	450-10	Bow surfing,	Shutdown
MO64	22-Jul	16:05:49	34.5472	-120.66888	Common dolphins	>100	10	Bow surfing	Shutdown
MO65	22-Jul	16:14:33	34.5506	-120.65629	Common dolphins	50	400	Swimming	
MO66	22-Jul	16:32:06	34.5591	-120.64798	Common dolphins	10	500	Foraging	Dolphins seem to like this area
MO67	22-Jul	16:36:28	34.5579	-120.65572	Common dolphins	~10	500	Foraging	
MO68	22-Jul	17:02:27	34.548	-120.69966	California Sea Lion	1	400	Swimming/jumping	
MO69	22-Jul	17:05:13	34.5471	-120.70427	California Sea Lion	2	300	Swimming/jumping	
MO70	22-Jul	17:13:58	34.5442	-120.71765	California Sea Lion	1	200	Swimming/jumping	
MO71	22-Jul	18:12:44	34.5605	-120.68386	Common dolphins	5-10	600	Swimming	
MO72	22-Jul	18:48:57	34.5739	-120.66581	Common dolphins	many	700	Swimming/jumping	
MO73	22-Jul	19:02:41	34.5701	-120.68499	California Sea Lion	1	100	Swimming	
MO74	22-Jul	19:09:30	34.568	-120.69434	California Sea Lion	2	150 + 300	Swimming	
MO75	22-Jul	19:42:52	34.5566	-120.74380	Common dolphins	~5	200	Swimming/jumping	

Log Entry	Date	Time (GMT)	Latitude	Longitude	Species	Number	Distance (m)	Behavior	Comment
MO76	22-Jul	19:48:11	34.5582	-120.74986	California Sea Lion	1	180	Swimming	In transit (not collecting data)
MO77	22-Jul	19:57:16	34.5653	-120.74671	Common dolphins	5-7	close	Swimming/jumping	Shutdown
MO78	22-Jul	20:06:21	34.5683	-120.73364	California Sea Lion	1	150	Swimming/jumping	
MO79	22-Jul	20:20:09	34.5729	-120.71373	Common dolphins	~40	500	Swimming	
MO80	22-Jul	20:28:54	34.5757	-120.70114	California Sea Lion	1	90	Foraging	Shutdown
MO81	22-Jul	21:33:52	34.587	-120.69168	California Sea Lion	1	120	Swimming	Outside exclusion zone before shutdown possible
MO82	22-Jul	21:52:00	34.581	-120.71851	California Sea Lion	1	130	Swimming	
MO83	22-Jul	22:19:46	34.5753	-120.75706	Common dolphins	10-20	250	Jumping	
MO84	22-Jul	22:28:06	34.5829	-120.75181	California Sea Lion	1	200	Swimming	
MO85	22-Jul	22:36:30	34.5855	-120.73979	Common dolphins	~10	200	Swimming	
MO86	22-Jul	22:41:55	34.5871	-120.73198	California Sea Lion	1	60	Swimming	Shutdown
MO87	22-Jul	22:57:57	34.5925	-120.70860	California Sea Lion	1	50	Swimming	Shutdown
MO88	22-Jul	23:04:01	34.5943	-120.70025	California Sea Lion	1	150	Swimming	
MO89	23-Jul	1:00:54	34.5929	-120.74901	California Sea Lion	1	200	Swimming	
MO90	23-Jul	23:10:21	34.4128	-120.20877	Common dolphins	~20	150	Swimming	Shutdown
MO91	24-Jul	0:32:36	34.413	-120.21981	Common dolphins	~15	100	Swimming	Shutdown
MO92	24-Jul	0:47:56	34.4022	-120.22999	Common dolphins	~10	50	Swimming	Shutdown
MO93	24-Jul	1:04:23	34.4192	-120.23095	Common dolphins	20	70	Swimming	Shutdown
MO94	24-Jul	1:12:50	34.429	-120.23071	Common dolphins	3	20	Swimming	Shutdown (MO94-MO95 colocated)
MO95	24-Jul	1:12:50	34.429	-120.23071	Common dolphins	2	150	Swimming	(MO94-MO95 colocated)
MO96	24-Jul	12:47:48	34.4416	-120.41875	Whales	2	800	Swimming	
MO97	24-Jul	13:31:44	34.4019	-120.40382	Common dolphins	2	500	Swimming	
MO98	24-Jul	13:43:15	34.3895	-120.40386	Common dolphins	30-40	50	Foraging	Shutdown
MO99	24-Jul	14:36:58	34.3466	-120.37384	Whale	1	500	Swimming	
MO100	24-Jul	15:11:11	34.3906	-120.37136	Common dolphins	10	50	Swimming	Shutdown
MO101	24-Jul	15:15:53	34.397	-120.37133	Whale	1	1000	Spout	
MO102	24-Jul	16:25:22	34.4116	-120.38222	Whale	1	1000	Spout	
MO103	24-Jul	17:08:58	34.3982	-120.39343	Common dolphins	3	150	Swimming	
MO104	24-Jul	17:20:33	34.4109	-120.39332	Common dolphins	2	15	Bow surfing	Shutdown
MO105	24-Jul	18:19:22	34.4276	-120.36044	Common dolphins	10	50	Swimming	Shutdown
MO106	24-Jul	18:57:59	34.3865	-120.35059	Common dolphins	~10	200	Swimming	In transit (not collecting data)
MO107	24-Jul	19:34:07	34.4297	-120.35009	Common dolphins	~50	400	Swimming	Shutdown
MO108	24-Jul	20:28:12	34.4293	-120.33892	Common dolphins	7	150	Swimming	Shutdown
MO109	24-Jul	21:34:49	34.4349	-120.32795	Common dolphins	~4	300	Swimming	
MO110	25-Jul	12:52:44	34.456	-120.32552	California Sea Lion	1	20	Jumping	In transit (not collecting data)
MO111	25-Jul	13:37:15	34.4086	-120.31708	Common dolphins	~10	30	Swimming	Shutdown
MO112	25-Jul	16:25:18	34.426	-120.28517	Common dolphins	~10	800	Swimming	
MO113	25-Jul	16:35:29	34.4392	-120.28515	Common dolphins	~10	300	Swimming	Shutdown, dolphins closed fast on RV
MO114	25-Jul	16:59:14	34.4536	-120.27431	California Sea Lion	1	500	Swimming	
MO115	25-Jul	17:04:26	34.4477	-120.27427	Common dolphins	~20	200	Swimming	Shutdown,dolphins closed fast on RV
MO116	25-Jul	17:32:32	34.4277	-120.27430	Common dolphins	~15	200	Swimming	Shutdown
MO117	25-Jul	17:42:37	34.4244	-120.27443	Common dolphins	~15	500	Bow surfing	Shutdown, dolphins closed fast on RV
MO118	25-Jul	17:55:06	34.4077	-120.27427	Common dolphins	10	500	Jumping	Shutdown
MO119	25-Jul	18:08:33	34.4029	-120.26401	Common dolphins	~15	200	Swimming	
MO120	25-Jul	22:51:47	34.4192	-120.35153	California Sea Lion	1	200	Swimming	
MO121	26-Jul	0:41:05	34.4347	-120.49774	Whale	2	3000	Foraging	Shutdown
MO121	26-Jul	0:41:05	34.4347	-120.49774	Common dolphins	>20	200	Foraging	Shutdown
MO121	26-Jul	0:41:05	34.4347	-120.49774	California Sea Lion	>5	150	Foraging	Shutdown
MO122	26-Jul	1:03:08	34.4572	-120.51009	Common dolphins	5	200	Swimming	Shutdown
MO122	26-Jul	1:03:08	34.4572	-120.51009	Whale	1	200	Swimming	Shutdown
MO123	26-Jul	15:30:27	34.6384	-120.66910	California Sea Lion	1	90	Swimming	Shutdown
MO124	26-Jul	17:50:00	34.6738	-120.63581	Common dolphins	lots	10-100	Foraging	Shutdown
MO125	26-Jul	18:03:27	34.6696	-120.65503	California Sea Lion	1	150	Swimming	
MO126	26-Jul	19:37:40	34.6708	-120.69221	Whale	1	>800	Fluke	
MO127	26-Jul	20:04:58	34.6797	-120.64960	Common dolphins	~10	500	Swimming	Shutdown
MO128	26-Jul	20:40:11	34.69	-120.64899	Whale	2	>800	Spouts	Shutdown
MO128	26-Jul	20:40:11	34.69	-120.64899	California Sea Lion	1	100	Swimming	Shutdown
MO129	26-Jul	20:47:47	34.6872	-120.66110	California Sea Lion	3	200	Swimming	
MO130	26-Jul	21:05:01	34.6814	-120.68808	Whale	1	>800	Spouts	
MO131	26-Jul	23:50:29	34.6936	-120.71693	Common dolphins	3	200	Swimming	
MO132	27-Jul	0:01:38	34.6922	-120.73009	Whale	2	500	Frolicking	
MO133	27-Jul	16:45:00	34.7614	-120.70750	California Sea Lion	1	75	Swimming	Shutdown
MO134	27-Jul	16:53:09	34.764	-120.69512	California Sea Lion	1	100	Swimming/jumping	Shutdown
MO135	27-Jul	18:46:00	34.7738	-120.73455	Common dolphins	10	300	Swimming/jumping	
MO136	27-Jul	18:54:43	34.7769	-120.72105	Common dolphins	10	100	Swimming/jumping	Shutdown
MO137	27-Jul	19:16	34.7844	-120.68678	California Sea Lion	1	150	Thermoregulating	
MO138	27-Jul	20:26:31	34.7944	-120.68386	California Sea Lion	1	150	Swimming/jumping	
MO139	27-Jul	21:02:45	34.7911	-120.73786	California Sea Lion	1	200	Jumping	
MO140	27-Jul	21:24:51	34.7999	-120.70070	California Sea Lion	1	150	Swimming	
MO141	27-Jul	21:35:26	34.804	-120.68299	California Sea Lion	1	200	Swimming/jumping	Shutdown
MO142	27-Jul	21:37:57	34.8048	-120.67871	California Sea Lion	2	150	Swimming/jumping	Shutdown
MO143	27-Jul	21:43:51	34.8068	-120.66931	California Sea Lion	1	200	Swimming	
MO144	27-Jul	22:07:02	34.8147	-120.63367	California Sea Lion	1	200	Jumping	
MO145	27-Jul	22:54:28	34.8121	-120.68769	California Sea Lion	2	150	Jumping	
MO146	27-Jul	23:05:11	34.8083	-120.70495	California Sea Lion	2	200	Swimming	Shutdown
MO147	28-Jul	0:05:47	34.8143	-120.76063	California Sea Lion	1	200	Swimming/jumping	
MO148	28-Jul	2:03:15	34.8283	-120.65544	California Sea Lion	1	50	Playing	Shutdown
MO149	28-Jul	13:59:28	34.858	-120.63072	California Sea Lion	1	200	Swimming	
MO150	28-Jul	15:18:06	34.8794	-120.67586	California Sea Lion	1	50	Swimming	Shutdown

Log Entry	Date	Time (GMT)	Latitude	Longitude	Species	Number	Distance (m)	Behavior	Comment
MO151	28-Jul	21:07:45	34.9708	-120.69512	California Sea Lion	1	200	Foraging	
MO152	28-Jul	22:15:13	34.9598	-120.69514	California Sea Lion	1	150	Floating	
MO153	28-Jul	23:57:05	34.911	-120.73561	California Sea Lion	1	150	Swimming	
MO154	29-Jul	0:49:45	34.9213	-120.67634	California Sea Lion	1	30	Swimming	In transit (not collecting data)
MO155	29-Jul	1:36:35	34.8877	-120.74048	California Sea Lion	1	100	Swimming	
MO156	29-Jul	1:52:02	34.8748	-120.75604	Common dolphins	20	300	Swimming	
MO157	29-Jul	1:58:48	34.8692	-120.76264	California Sea Lion	1	150	Swimming	
MO158	29-Jul	2:48:04	34.8696	-120.72154	California Sea Lion	1	80	Swimming	
MO159	29-Jul	13:45:31	34.8769	-120.64671	California Sea Lion	1	10	Diving	In transit (not collecting data)
MO160	29-Jul	14:55:38	34.8533	-120.70708	California Sea Lion	2	110	Diving	Outside exclusion zone before shutdown possible
MO161	29-Jul	17:34	34.9062	-120.72186	Common dolphins	2	20	Swam under boat	Shutdown
MO162	29-Jul	18:05:59	34.8716	-120.70760	Harbor Seal	1	150	Nosing above water	
MO163	29-Jul	18:41:15	34.8393	-120.66902	California Sea Lion	1	150	Swimming/jumping	
MO164	29-Jul	19:28:54	34.7888	-120.67917	California Sea Lion	5	300	Swimming/jumping	
MO165	29-Jul	19:40:05	34.7753	-120.68364	Whale	1	500	Swimming/spouting	
MO166	29-Jul	20:09:36	34.7388	-120.68565	California Sea Lion	1	75	Swimming	Shutdown
MO167	29-Jul	20:30:52	34.7138	-120.67051	Common dolphins	200	10	Foraging	Shutdown-3 lines for MO167
MO167	29-Jul	20:30:52	34.7138	-120.67051	California Sea Lion	60	20	Foraging	Shutdown-3 lines for MO167
MO167	29-Jul	20:30:52	34.7138	-120.67051	Humpback	3	500	Foraging	Shutdown-3 lines for MO167
MO168	29-Jul	20:48:01	34.6959	-120.65945	Common dolphins	200	300	Swimming	Shutdown
MO169	29-Jul	22:27:42	34.6245	-120.68539	California Sea Lion	2	110	Swimming	Outside exclusion zone before shutdown possible
MO170	30-Jul	1:04:10	34.674	-120.64061	Common dolphins	2	150	Swimming	
MO171	30-Jul	2:14:04	34.6103	-120.66730	Whale	1	1000	Spouting	
MO172	30-Jul	13:58:35	34.3814	-120.39331	Common dolphins	~2	10	Swimming	Shutdown
MO173	30-Jul	14:47:02	34.3356	-120.39291	Common dolphins	>100	300	Swimming/jumping	
MO174	30-Jul	14:56:15	34.3275	-120.39274	Common dolphins	~25	30	Swimming	Shutdown
MO175	30-Jul	15:14:08	34.312	-120.39249	Common dolphins	3	50	Swimming	Shutdown
MO176	30-Jul	15:58:29	34.264	-120.35656	Common dolphins	~20	800	Swimming	In transit (not collecting data)
MO177	30-Jul	16:15:31	34.244	-120.31176	Rizzo dolphins	~10	500	Swimming	In transit (not collecting data)
MO178	30-Jul	16:29:23	34.2459	-120.29975	Rizzo dolphins	~10	600	Swimming	
MO179	30-Jul	17:32:36	34.3141	-120.32373	Rizzo dolphins	~3	200	Swimming	
MO180	30-Jul	18:12:27	34.3606	-120.32286	Common dolphins	25	100	Swimming	Shutdown
MO181	30-Jul	19:17:05	34.3905	-120.38251	Common dolphins	>50	300	Swimming	Shutdown, closing fast on RV
MO182	30-Jul	19:32:17	34.4102	-120.39090	Common dolphins	20	400	Swimming	
MO183	30-Jul	20:09:48	34.4368	-120.36304	Common dolphins	20	60	Swimming	Shutdown
MO184	30-Jul	22:39:05	34.452	-120.29650	Common dolphins	~50	120	Foraging	Shutdown
MO185	31-Jul	0:39:29	34.4146	-120.33743	Common dolphins	10	300	Swimming	
MO186	31-Jul	0:43:57	34.4084	-120.33741	California Sea Lion	1	200	Swimming	
MO187	31-Jul	14:12:29	34.3913	-120.35468	Common dolphins	2	10	Swimming	Shutdown
MO188	31-Jul	14:18:43	34.3991	-120.35786	Common dolphins	5-7	10	Swimming	Shutdown
MO189	31-Jul	15:29:13	34.4051	-120.34114	Common dolphins	12	10	Bow surfing	Shutdown
MO190	31-Jul	15:36:06	34.3974	-120.33818	Whale	1	1500	Spouting	
MO191	31-Jul	15:38:58	34.3944	-120.33673	Common dolphins	~100	100	Feeding frenzy	In transit (not collecting data)
MO192	31-Jul	17:31:10	34.4212	-120.30969	Common dolphins	~100	<5	Swimming/jumping	Shutdown
MO193	31-Jul	20:32:45	34.446	-120.09761	Common dolphins	40	400	Swimming	

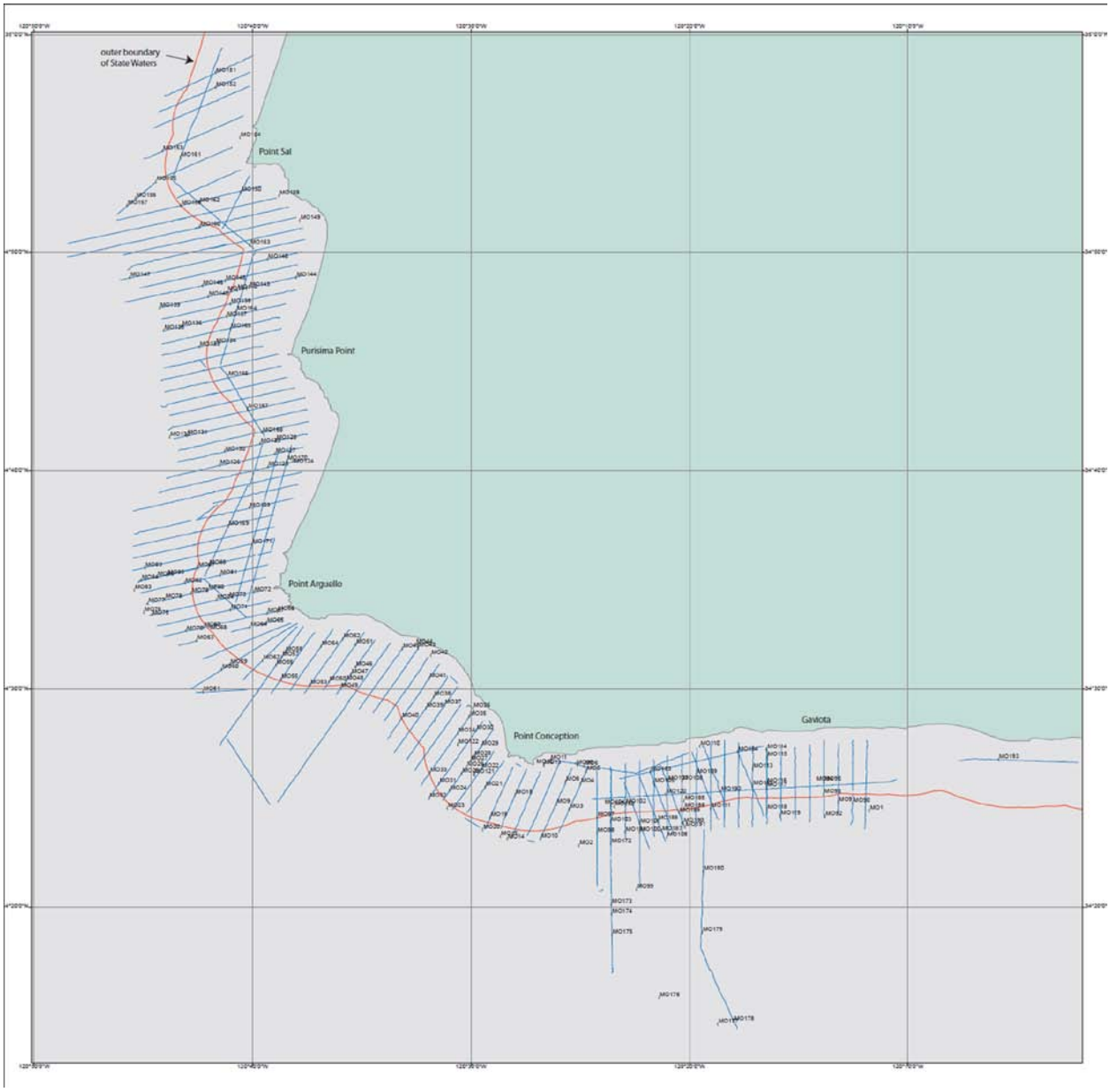

Figure 1. Marine wildlife observation points and vessel track lines

Appendix A: Gaviota to Point Sal MMO Sign-in Forms

Marine Environmental Variables Form

Date: 7/19/14 Monitor: SRH

MMO Sign-in	GMT Time	Latitude	Longitude	Vessel Activity	Weather	Cloud Cover	Glare	Visibility	Wind Speed	Sea State	Swell Height	Comments
7/19 SRH	4:30	34°24.35	120°08.9	Seismic mag	Clear	Broken	None	Good	14Kt	Some whitecaps	5ft	equipment failed at 6 PM
7/20 JB	1520	34 22.99	120 13.43	Seismic mag	Clear	[illegible]	None	good	[illegible]	[illegible]	3ft	
SJ	1700	Get from log	Get from log	Seismic mag	Clear	Minor	NO	V. good	4 Kt	Calm	2-3ft	
JB	1900	34 24.7[illegible]	120 [illegible]	Seismic mag	Clear	[illegible]	NO	V. good	[illegible]	[illegible]	[illegible]	
SRH	2000	34 25.95	120 29.52	" "	Clear	Minor	No	V good	4 kt	Calm	[illegible]	
JB	2120	34 25.74	120 29.[illegible]	[illegible]	[illegible]	[illegible]	No	V. good	4Kt	[illegible]	2-3'	
SJ	2300	From new log		Seismic mag	clear	Minor	None	V. Good	2Kt	calm	2-3'	
SRH	2356	34°29.47	120°29.5	" "	Clear	Mostly Clear	Yes	V good	5Kt	V calm	2-3'	
SJ	0215			"	"	Clear	No	V. Good >10 miles	2Kt.	V. calm	1-2	End of day
JB												
SJ	[illegible]	[illegible]	[illegible]	Drop [illegible]	[illegible]							

Manned Observers: SRH- Steve Hartwell ABG- Alicia Bolster-Gee
JB- Jeff Beeson JEC- Jamie Conrad
SJ- Sam Johnson

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Marine Environmental Variables Form

Date: 7/21/14 Monitor: SRH

MMO Sign-in	Time	Latitude	Longitude	Vessel Activity	Weather	Cloud Cover	Glare	Visibility	Wind Speed	Sea State	Swell Height	Comments
SJ	1243	Get fm Log	Get fm Log	Seismic mcg	Calm	Overcast	None	Good	0	Calm	0-2	
JB	1435	34 30 29	120 31 24	Seismic mcg	calm	overcast	none	good	0	calm	0-2	
SJ	1605	34 31 22	120 32 15	Seismic mcg	Calm	high overcast	none	V.good	0	Calm	0-2	
JB	1303	34 30.94	120 32.18	Seismic mcg	calm	high overcast	None	V.good	0	Calm	0-2	
SRH	2000	34°30.21	120° 35.85	" "	Calm	Minor	None	Vgood	0-1	Calm	0-2	
SJ	2150	From Log		Seismic mcg	Calm	Minor	None	V.good	0-1	Calm	0-2	
SRH	2200	From Log		Seismic mcg	Calm	Minor	None	Good	0-2	Calm	0-2	
SJ	0001	From log		Seismic mcg	Calm	Minor	None	Good	0-2	Calm	0-2	
	7/22	34 31.16										
7/22 SJ	1230/303	34°31.64	120°43.11	Pre-Seismic mcg	Calm	Minor	None	Good	3-5	Calm	0-2	First line soling @ 1230+1
JB	1409	3 Get log		Seismic mcg	Calm	Minor	Minor	good	3-5	calm	0-2	
SJ	1601	34°32.95	120°39.58	Seismic mcg	Calm	None	Minor	Good	3-5	Calm	0-2	
JB	1810	34 33.59	120 41.19	Seismic mcg	calm	NONE	Minor	Good	3-5	calm	4-5	

Marine Environmental Variables Form

Date: 7/22/14 (23)

Monitor: _____

MMO Sign-in	Time	Latitude	Longitude	Vessel Activity	Weather	Cloud Cover	Glare	Visibility	Wind Speed	Sea State	Swell Height	Comments
SRH	2030	34°33.6	120°43.6	Seismic mag	Clear	No	No	V good	10 Kt	Slight chop	4-5'	
SJ	0013	34°36.42	120°41.16	Seismic mag	Clear	None	Some-heading offshore	V.good	5-10 Kt	Slight chop	2-3	
JB	0243	34 [illegible]	120 45.30	[illegible]	Clear	[illegible]	[illegible]	good	[illegible]	[illegible]	[illegible]	
7/23/14												
JB	0115	[illegible]	[illegible]	[illegible]	Clear	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3-4	short day
NJG	0309	34°27.01	120°12.52	Seismic mag	Clear	None	None	good	15-20 Kt	Choppy	3-4	Gale winds
(7/24) SRH	1221	34°26.87	120°26.5	Seismic mag	Clear	None	No	good	0-3 Kt	Calm	0-1'	
SJ	1503	34°23.29	120°22.70	Seismic mag	clear	None	No	V.good	15 Kt.	choppy	1-2'	
JB	1654	34°23.01	120°23.61	Seismic mag	Clear	none	No	V. good	15 Kt	chop	1-2	
SJ	1810	34°26.27	120°21.62	Seismic mag	clear	none	No	V.good	15 Kt	choppy	1-2'	
NJG	1856	34°23.07	120°21.17	Seismic mag	clear	none	No	V. good	15 Kt	choppy	1-2'	
SJ	2205	34°26.91'	120°20.72	Seismic mag	clear	none	No	V.good	15 Kt	choppy	1-2'	
7/25 SRH	1243	34°26.7	120°19.8	Seismic mag	Some Haze	Minor	No	good	0-3 Kt	minor chop	1-2'	

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Marine Environmental Variables Form

Date: 7/25/14 - 7/26/14 Monitor: _____

MMO Sign-in	Time	Latitude	Longitude	Vessel Activity	Weather	Cloud Cover	Glare	Visibility	Wind Speed	Sea State	Swell Height	Comments
SJ	1510	34°27.01	120°17.82	Seismic mcg	Clear	None	None	Good	5 Kt	Residual Chop	2'	
ABG	1702	34° 26.95	120° 16.93	Seismic mcg	clear	none	None	V. Good	5kt	bit choppy	2'	
JB	1900	34 27.28	120° 15 16	Seismic mcg	Clear	Sirus Clouds	NONe	V. good	5kt	light chop	2'	
SRH	2141	34°25.56	120°14.03	Seismic mag	Clear	Sirus Clouds	Minor	V good	5-7kt	Chop	2-3'	
ABG	2232	34° 25.26	120° 19.12	Seismic mag	Clear	Sirus Clouds	Moderate	V. good	5kt	Chop	2-3'	
SJ	0123	34°28.67'	120° 31.30	Seismic mcg	clear	Cirrus clouds	None	Good	10kt	Chop	3'	
7/26 SRH	1251	34° 37.76	120° 43.07	Seismic mag	foggy	foggy	None	poor	0 kt	Mostly Calm	1-3'	
SJ	1531	34°38.39	120°39.67	Seismic mcg	foggy lifting	foggy lifting	None	poor	0 kt	calm	2-3'	
JB	1720	34 39.53	120 39.89	Seismic mag	foggy lifting	foggy	none	poor	0kt	calm	2-3'	
ABG	1852	34° 39.22	120° 43.40	Seismic mag	foggy lifting	foggy	None	good	0kt	calm	2-3'	
JB	2045	Check log	Check log	Seismic mag	Foggy	Foggy	None	good	0 kt	calm	2-3'	
ABG	2251	34° 42.02	120° 37.34	Seismic mag	slightly foggy	foggy	None	good	0 kt	calm	2-3'	
SJ	0018	34°42.12	120°43.00	Seismic mcg	V. light fog-calm	light fog	None	Good	1 kt	calm	2-3'	

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Marine Environmental Variables Form

Date: 7/26-14 / 7-27/14 Monitor: _____

MMO Sign-in	Time	Latitude	Longitude	Vessel Activity	Weather	Cloud Cover	Glare	Visibility	Wind Speed	Sea State	Swell Height	Comments
SRH	0138	34°43.66	120°38.79	Seismic Mag	clear	cloudy	No	good	1-2kt	textured	1-3'	
ABG	0209	34° 42.58	120° 41.43	Seismic Mag	clear	cloudy	none	good	1-2kt	calm	1-3'	
SRH	0255	34°43.13	120°43.55	Seismic Mag	Clear	cloudy	No	fair	1-2kt	Calm	1-3'	End of day
7/27 SRH	1301	34°43.13	120°44.46	Seismic Mag	fog	cloudy	No	Poor	0-1kt	Calm	1-2'	
SJ	1545	34°45.65	120°40.05	Seismic Mag	fog	fog	No	Fair to Poor	0-2 kt	Calm	1-2'	
JB	1714	34°46.30	120°39.59	Seismic Mag	fog	fog	No	poor	0-2kt	calm	1-2'	
SJ	1817	34°46.24	120°42.42	Seismic Mag	fog	fog	NO	Poor to fair	0-2kt	Calm	1-3'	Much less fog offshore.
ABG	1858	34°46.70	120°42.87	Driving	fog	fog	none	poor fair	0-2kt	V. calm	1-3'	
SJ	0000	34	120	Seismic Mag	Light fog	Light fog	None	Fair	0-2kt	Calm	1-3'	
SRH	0104	34°50.01	120°40.34	Seismic Mag	light fog	cloudy	NO	fair	0-2kt	Calm	1-2'	
SJ	0108	34°49.61	120°39.75	Seismic Mag	v. light fog	Light fog	No	Good	0-2kt	Calm	1-2'	End of day
ABG	1240	34°43.43	120°50.17	Pre-deploy seismicing	clear	fog	No	Good	0-2kt	Calm	1-2'	
SJ	1456	34°51.23	120°41.31	Seismic Mag	Foggy	fog	No	Fair to Poor	0-2kt	calm	1-2	

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Marine Environmental Variables Form

Date: 07-28-14/07-29-14 Monitor: _____

MMO Sign-in	Time	Latitude	Longitude	Vessel Activity	Weather	Cloud Cover	Glare	Visibility	Wind Speed	Sea State	Swell Height	Comments
AJO	1619	34°57.59	120° 42.64	Seismic mag	foggy	fog	none	poor-fair	0-2kts	Calm	1-2'	
JEC	2019	34° 58.99	120° 43.09	Seismic mag	hazy	overcast	none	Fair	2-4kts	calm	1-2'	
SJ	2359	34°54.73	120°43.05	Seismic mag	hazy	Slight overcast	None	fair	3-6Kts	Calm	1-2'	
JEC	0131	34° 53.30	120° 43.37	seismic mag	[illegible]	scattered	mild	good	[illegible]	calm	1-2'	
SRH	1245	34°43.60	120° 39.96	Seismic mag	foggy	fog	NO	1/4 km poor	0	Slight Chop	0-1'	
SJ	1501	34°51.31	120°41.92	Seismic mcs	Foggy	Fog	No	3Km- can see shore	1-2Kt.	V. slight chop	1-2'	
SRH	1704	34°56.70	120°42.40	Seismic mag	foggy	fog	No	2-3 km fair	1-2Kt	Mostly calm	1-2'	
SJ	1802	34°52.50	120°42.67	Seismic mcs	foggy	fog	No	~2-3km	2Kt.	calm	1-2'	
JEC	1900	34°49.15	120°40.19	Seismic mag	hazy	overcast	none	~5 km	3-4 Kts	slight chop	1-3'	
SRH	2200	34°39.50	120°39.36	Seismic mag	clear	overcast	NO	10Km	3-5 kt	chop	1-3'	
JEC	2304	34° 34.45	120° 41.81	seismic mag	clear	broken	mild	10 km+	4-6 kt	scattered whitecap	1-3'	
SJ	0001	34°35.41	120°39.81	Seismic mcs	clear	high cirrus	none	V.good	10 kt.	Choppy, whitecap	1-3'	
JEC	0133	34° 39.77	120° 39.15	Seismic mcs	clear	"	medium	"	"	"	"	

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Marine Environmental Variables Form

Date: 7-30-14 Monitor: _____

MMO Sign-in	Time	Latitude	Longitude	Vessel Activity	Weather	Cloud Cover	Glare	Visibility	Wind Speed	Sea State	Swell Height	Comments
SRH	1253	34°26.57	120°25.18	Seismic mag	clear	70%	NO	good	3-4 Kt	slight chop	1-2'	
SJ	1513	34°18.77	120°23.55	Seismic mag	clear	High cirrus	No	good	8 Kt	Chop	2'	
SRH	1703	34°16.99	120°18.96	Seismic mag	clear	High cirrus	NO	good	18 Kt	chop	2-4'	
SJ	1901	34°20.87	120°19.40	Seismic Mag	clear	High Cirrus	NO	V. good	20 Kt	chop	2-3'	
JEC	1909	34°28.86	120°28.[illegible]	Seismic mag	clear	broken	none	v good	30 kt	choppy	2-3'	
SRH	2107	34°27.32	120°16.87	Seismic mag	clear	broken	No	V good	20 kt	chop	2'	
JEC	2307	34 25.23	120° 18.40	Seismic mag	clear	broken	mild	v good	20 kt	chop	2-3'	
SJ	0002	34°27.03	120°18.07	Seismic mag	clear	broken high	mild	V. good	15 Kts	chop	2-3'	
JEC	0136	34°25.36	120° 21.52	seismic mag	clear	broken	mild	v. good	15 Kt	choppy	2-3'	

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Marine Environmental Variables Form

Date: 7/31/14 Monitor: _____

MMO Sign-in	Time	Latitude	Longitude	Vessel Activity	Weather	Cloud Cover	Glare	Visibility	Wind Speed	Sea State	Swell Height	Comments
SRH	1245	34°26.58	120°20.53	Seismic Mag	Clear	NO	NO	V.good	0-1 Kt	Calm	0	
SJ	1504	34°26.13	120°21.19	Seismic mag	clear	No	No	V.good	5Kt.	Calm nearshore chop off	'	
SRH	1703	34°27.10	120° 19.76	Seismic mag	clear	No	slight	V.good	5 Kt.	Calm nearshore chop off	1-2'	
JEL	2049	34° 26.53	120°17.96	Seismic	clear	none	none	15 km V.good	5 Kts	s. c. q	1-2'	

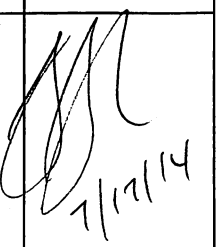
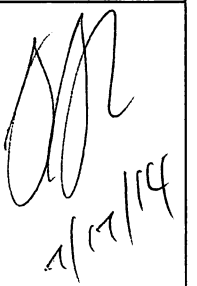
Appendix B: Gaviota to Point Sal Exhibit H

Mitigation Measure (MM)	Location and Scope of Mitigation	Effectiveness Criteria	Monitoring or Reporting Action	Responsible Party	Timing	Implementation Date(s) and Initials
Air Quality and Greenhouse Gas (GHG) Emissions (MND Section 3.3.3)						
MM AIR-1: Engine Tuning, Engine Certification, and Fuels. The following measures will be required to be implemented by all Permittees under the Offshore Geophysical Permit Program (OGPP), as applicable depending on the county offshore which a survey is being conducted	All Counties: Maintain all construction equipment in proper tune according to manufacturers' specifications; fuel all off-road and portable diesel-powered equipment with California Air Resources Board (CARB)-certified motor vehicle diesel fuel limiting sulfur content to 15 parts per million or less (CARB Diesel).	Daily emissions of criteria pollutants during survey activities are minimized.	Determine engine certification of vessel engines. Review engine emissions data to assess compliance, determine if changes in tuning or fuel are required.	OGPP permit holder and contract vessel operator; California State Lands Commission (CSLC) review of Final Monitoring Report.	Prior to, during, and after survey activities. Submit Final Monitoring Report after completion of survey activities.	
	Los Angeles and Orange Counties: Use vessel engines meeting CARB's Tier 2-certified engines or cleaner; the survey shall be operated such that daily NO_x emissions do not exceed 100 pounds based on engine certification emission factors. This can be accomplished with Tier 2 engines if daily fuel use is 585 gallons or less, and with Tier 3 engines if daily fuel use is 935 gallons or less.		Verify that Tier-2 or cleaner engines are being used. Calculate daily NO_x emissions to verify compliance with limitations.			
	San Luis Obispo County: Use vessel engines meeting CARB's Tier 2-certified engines or cleaner, accomplished with Tier 2 engines if daily fuel use is 585 gallons or less; all diesel equipment shall not idle for more than 5 minutes; engine use needed to maintain position in the water is not considered idling; diesel idling within 300 meters (1,000 feet) of sensitive receptors is not permitted; use alternatively fueled construction equipment on site where feasible, such as compressed natural gas, liquefied natural gas, propane or biodiesel.		Verify that Tier-2 or cleaner engines are being used. Inform vessel operator(s) of idling limitation. Investigate availability of alternative fuels.			5/8/14
	Santa Barbara County: Use vessel engines meeting CARB's Tier 2-certified engines or cleaner, accomplished with Tier 2 engines if daily fuel use is 790 gallons or less;		Verify that Tier-2 or cleaner engines are being used. Investigate availability of alternative fuels.			5/8/14
	Ventura County: Use alternatively fueled construction equipment on site where feasible, such as compressed natural gas, liquefied natural gas, propane or biodiesel.		Investigate availability of alternative fuels.			

Mitigation Measure (MM)	Location and Scope of Mitigation	Effectiveness Criteria	Monitoring or Reporting Action	Responsible Party	Timing	Implementation Date(s) and Initials
MM BIO-1: Marine Mammal and Sea Turtle Presence – Current Information.	All State waters; prior to commencement of survey operations, the geophysical operator shall (1) contact the National Oceanic and Atmospheric Administration Long Beach office staff and local whale-watching operations and shall acquire information on the current composition and relative abundance of marine wildlife offshore, and (2) convey sightings data to the vessel operator and crew, survey party chief, and onboard Marine Wildlife Monitors (MWMs) prior to departure. This information will aid the MWMs by providing data on the approximate number and types of organisms that may be in the area.	No adverse effects to marine mammals or sea turtles due to survey activities are observed.	Document contact with appropriate sources. Submit Final Monitoring Report after completion of survey activities.	OGPP permit holder; Inquiry to NOAA and local whale watching operators.	Prior to survey.	7/7/14
MM BIO-2: Marine Wildlife Monitors.	A minimum of two qualified MWMs who are experienced in marine wildlife observations shall be onboard the survey vessel throughout both transit and data collection activities. The specific monitoring, observation, and data collection responsibilities shall be identified in the Marine Wildlife Contingency Plan required as part of all Offshore Geophysical Permit Program permits. Qualifications of proposed MWMs shall be submitted to the National Oceanic and Atmospheric Administration (NOAA) and CSLC at least two weeks in advance of the survey for their approval by the agencies. Survey operations shall not commence until the CSLC approves the MWMs.	Competent and professional monitoring or marine mammals and sea turtles; compliance with established monitoring policies.	Document contact with and approval by appropriate agencies. Submit Final Monitoring Report after completion of survey activities.	OGPP permit holder.	Prior to survey.	7/7/14
MM BIO-3: Safety Zone Monitoring.	Onboard MWMs responsible for observations during vessel transit shall be responsible for monitoring during the survey equipment operations. All visual monitoring shall occur from the highest practical vantage point aboard the survey vessel; binoculars shall be used to observe the surrounding area, as appropriate. The MWMs will survey an area (i.e., safety or exclusion zone) based on the equipment used, centered on the sound source (i.e., vessel, towfish), throughout time that the survey equipment is operating. Safety zone radial distances, by equipment type, include:	No adverse effects to marine mammals or sea turtles due to survey activities are observed; compliance with established safety zones.	Compliance with permit requirements (observers); compliance with established safety zones. Submit Final Monitoring Report after completion of survey activities.	OGPP permit holder.	Prior to survey.	7/7/14

Equipment Type	Safety Zone (radius, m)
Single Beam Echosounder	50
Multibeam Echosounder	500
Side-Scan Sonar	600
Subbottom Profiler	100
Boomer System	100

Mitigation Measure (MM)	Location and Scope of Mitigation	Effectiveness Criteria	Monitoring or Reporting Action	Responsible Party	Timing	Implementation Date(s) and Initials
	The onboard MWMs shall have authority to stop operations if a mammal or turtle is observed within the specified safety zone and may be negatively affected by survey activities. The MWMs shall also have authority to recommend continuation (or cessation) of operations during periods of limited visibility (i.e., fog, rain) based on the observed abundance of marine wildlife. Periodic reevaluation of weather conditions and reassessment of the continuation/cessation recommendation shall be completed by the onboard MWMs. During operations, if an animal's actions are observed to be irregular, the monitor shall have authority to recommend that equipment be shut down until the animal moves further away from the sound source. If irregular behavior is observed, the equipment shall be shut-off and will be restarted and ramped-up to full power, as applicable, or will not be started until the animal(s) is/are outside of the safety zone or have not been observed for 15 minutes. For nearshore survey operations utilizing vessels that lack the personnel capacity to hold two MWMs aboard during survey operations, at least twenty-one (21) days prior to the commencement of survey activities, the Permittee may petition the CSLC to conduct survey operations with one MWM aboard. The CSLC will consider such authorization on a case-by-case basis and factors the CSLC will consider will include the timing, type, and location of the survey, the size of the vessel, and the availability of alternate vessels for conducting the proposed survey. CSLC authorizations under this subsection will be limited to individual surveys and under any such authorization, the Permittee shall update the MWCP to reflect how survey operations will occur under the authorization.					
MM BIO-4: Limits on Nighttime OGPP Surveys.	All State waters; nighttime survey operations are prohibited under the OGPP, except as provided below. The CSLC will consider the use of single beam echosounders and passive equipment types at night on a case-by-case basis, taking into consideration the equipment specifications, location, timing, and duration of survey activity.	No adverse effects to marine mammals or sea turtles due to survey activities are observed.	Pre-survey request for nighttime operations, including equipment specifications and proposed use schedule. Document equipment	OGPP permit holder.	Approval required before survey is initiated. Monitoring Report following	7/17/14

Mitigation Measure (MM)	Location and Scope of Mitigation	Effectiveness Criteria	Monitoring or Reporting Action	Responsible Party	Timing	Implementation Date(s) and Initials
			use. Submit Final Monitoring Report after completion of survey activities.		comple-tion of survey.	
MM BIO-5: Soft Start.	All State waters; the survey operator shall use a "soft-start" technique at the beginning of survey activities each day (or following a shut down) to allow any marine mammal that may be in the immediate area to leave before the sound sources reach full energy. Surveys shall not commence at nighttime or when the safety zone cannot be effectively monitored. Operators shall initiate each piece of equipment at the lowest practical sound level, increasing output in such a manner as to increase in steps not exceeding approximately 6 decibels (dB) per 5-minute period. During ramp-up, the marine wildlife monitors shall monitor the safety zone. If marine mammals are sighted within or about to enter the safety zone, a power-down or shut-down shall be implemented as though the equipment was operating at full power. Initiation of ramp-up procedures from shut-down requires that the marine wildlife monitors be able to visually observe the full safety zone.	No adverse effects to marine mammals or sea turtles due to survey activities are observed.	Compliance with permit requirements (observers); compliance with safe start procedures. Submit Final Monitoring Report after completion of survey activities.	OGPP permit holder.	Imme-diately prior to survey.	 1/17/14
MM BIO-6: Practical Limitations on Equipment Use and Adherence to Equipment Manufacturer's Routine Maintenance Schedule.	All State waters; geophysical operators shall follow, to the maximum extent possible, the guidelines of Zykov (2013) as they pertain to the use of subbottom profilers and side-scan sonar, including: • Using the highest frequency band possible for the subbottom profiler; • Using the shortest possible pulse length; and • Lowering the pulse rate (pings per second) as much as feasible. Geophysical operators shall consider the potential applicability of these measures to other equipment types (e.g., boomer). Permit holders will conduct routine inspection and maintenance of acoustic-generating equipment to ensure that low energy geophysical equipment used during permitted survey activities remains in proper working order and within manufacturer's equipment specifications. Verification of the date and occurrence of such equipment	No adverse effects to marine mammals or sea turtles due to survey activities are observed.	Document initial and during survey equipment settings. Submit Final Monitoring Report after completion of survey activities.	OGPP permit holder.	Imme-diately prior to and during survey.	 1/17/14

Mitigation Measure (MM)	Location and Scope of Mitigation	Effectiveness Criteria	Monitoring or Reporting Action	Responsible Party	Timing	Implementation Date(s) and Initials
	inspection and maintenance shall be provided in the required presurvey notification to CSLC.					
MM BIO-7: Avoidance of Pinniped Haul-Out Sites.	The Marine Wildlife Contingency Plan (MWCP) developed and implemented for each survey shall include identification of haul-out sites within or immediately adjacent to the proposed survey area. For surveys within 300 meters (m) of a haul-out site, the MWCP shall further require that: • The (survey) vessel shall not approach within 91 m of a haul-out site, consistent with National Marine Fisheries Service (NMFS) guidelines; • Survey activity close to haul-out sites shall be conducted in an expedited manner to minimize the potential for disturbance of pinnipeds on land; and • Marine wildlife observers shall monitor pinniped activity onshore as the vessel approaches, observing and reporting on the number of pinnipeds potentially disturbed (e.g., via head lifting, flushing into the water). The purpose of such reporting is to provide CSLC and California Department of Fish and Wildlife (CDFW) with information regarding potential disturbance associated with OGPP surveys.	No adverse effects to pinnipeds at haul outs are observed.	Document pinniped reactions to vessel presence and equipment use. Submit Final Monitoring Report after completion of survey activities.	OGPP permit holder.	Monitoring Report following comple-tion of survey.	1/17/14
MM BIO-8: Reporting Requirements - Collision.	All State waters; if a collision with marine mammal or reptile occurs, the vessel operator shall document the conditions under which the accident occurred, including the following: • Vessel location (latitude, longitude) when the collision occurred; • Date and time of collision; • Speed and heading of the vessel at the time of collision; • Observation conditions (e.g., wind speed and direction, swell height, visibility in miles or kilometers, and presence of rain or fog) at the time of collision; • Species of marine wildlife contacted (if known); • Whether an observer was monitoring marine wildlife at the time of collision; and, • Name of vessel, vessel owner/operator, and captain officer in charge of the vessel at time of collision. After a collision, the vessel shall stop, if safe to do so; however, the vessel is not obligated to stand by and may proceed after confirming that it will not further damage the animal by doing so. The vessel will then immediately communicate by radio or telephone all details to the	No adverse effects to marine mammals or sea turtles due to survey activities are observed.	Submit Final Monitoring Report after completion of survey activities.	OGPP permit holder.	Monitoring Report following comple-tion of survey.	1/14/14

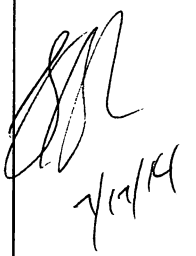
Mitigation Measure (MM)	Location and Scope of Mitigation	Effectiveness Criteria	Monitoring or Reporting Action	Responsible Party	Timing	Implementation Date(s) and Initials
	vessel's base of operations, and shall immediately report the incident. Consistent with Marine Mammal Protection Act requirements, the vessel's base of operations or, if an onboard telephone is available, the vessel captain him/herself, will then immediately call the NOAA Stranding Coordinator to report the collision and follow any subsequent instructions. From the report, the Stranding Coordinator will coordinate subsequent action, including enlisting the aid of marine mammal rescue organizations, if appropriate. From the vessel's base of operations, a telephone call will be placed to the Stranding Coordinator, NOAA NMFS, Southwest Region, Long Beach, to obtain instructions. Although NOAA has primary responsibility for marine mammals in both State and Federal waters, The California Department of Fish and Wildlife will also be advised that an incident has occurred in State waters affecting a protected species.					
MM BIO-9: Limitations on Survey Operations in Select Marine Protected Areas (MPAs).	All MPAs; prior to commencing survey activities, geophysical operators shall coordinate with the CLSC, California Department of Fish and Wildlife (CDFW), and any other appropriate permitting agency regarding proposed operations within MPAs. The scope and purpose of each survey proposed within a MPA shall be defined by the permit holder, and the applicability of the survey to the allowable MPA activities shall be delineated by the permit holder. If deemed necessary by CDFW, geophysical operators will pursue a scientific collecting permit, or other appropriate authorization, to secure approval to work within a MPA, and shall provide a copy of such authorization to the CSLC as part of the required presurvey notification to CSLC. CSLC, CDFW, and/or other permitting agencies may impose further restrictions on survey activities as conditions of approval.	No adverse effects to MPA resources due to survey activities are observed.	Monitor reactions of wildlife to survey operations; report on shutdown conditions and survey restart. Submit Final Monitoring Report after completion of survey activities.	OGPP permit holder; survey permitted by CDFW.	Prior to survey.	

EXHIBIT H

Mitigation Monitoring Program

Mitigation Measure (MM)	Location and Scope of Mitigation	Effectiveness Criteria	Monitoring or Reporting Action	Responsible Party	Timing	Implementation Date(s) and Initials
MM HAZ-1: Oil Spill Contingency Plan (OSCP) Required Information.	Permittees shall develop and submit to CSLC staff for review and approval an OSCP that addresses accidental releases of petroleum and/or non-petroleum products during survey operations. Permittees' OSCPs shall include the following information for each vessel to be involved with the survey: • Specific steps to be taken in the event of a spill, including notification names, phone numbers, and locations of: (1) nearby emergency medical facilities, and (2) wildlife rescue/response organizations (e.g., Oiled Wildlife Care Network); • Description of crew training and equipment testing procedures; and • Description, quantities and location of spill response equipment onboard the vessel.	Reduction in the potential for an accidental spill. Proper and timely response and notification of responsible parties in the event of a spill.	Documentation of proper spill training. Notification of responsible parties in the event of a spill.	OGPP permit holder and contract vessel operator.	Prior to survey.	1/17/14
MM HAZ-2: Vessel fueling restrictions.	Vessel fueling shall only occur at an approved docking facility. No cross vessel fueling shall be allowed.	Reduction in the potential for an accidental spill.	Documentation of fueling activities.	Contract vessel operator.	Following survey.	1/17/14
MM HAZ-3: OSCP equipment and supplies.	Onboard spill response equipment and supplies shall be sufficient to contain and recover the worst-case scenario spill of petroleum products as outlined in the OSCP.	Proper and timely response in the event of a spill.	Notification to CSLC of onboard spill response equipment/supplies inventory, verify ability to respond to worst-case spill.	Contract vessel operator.	Prior to survey.	1/17/14

Mitigation Measure (MM)	Location and Scope of Mitigation	Effectiveness Criteria	Monitoring or Reporting Action	Responsible Party	Timing	Implementation Date(s) and Initials
MM HAZ-1: Oil Spill Contingency Plan (OSCP) Required Information.	Outlined under **Hazards and Hazardous Materials** (above)					
MM HAZ-2: Vessel fueling restrictions.	Outlined under **Hazards and Hazardous Materials** (above)					
MM HAZ-3: OSCP equipment and supplies.	Outlined under **Hazards and Hazardous Materials** (above)					
MM BIO-9: Limitations on Survey Operations in Select MPAs.	Outlined under **Biological Resources** (above)					
MM REC-1: U.S. Coast Guard (USCG), Harbormaster, and Dive Shop Operator Notification.	All California waters where recreational diving may occur; as a survey permit condition, the CSLC shall require Permittees to provide the USCG with survey details, including information on vessel types, survey locations, times, contact information, and other details of activities that may pose a hazard to divers so that USCG can include the information in the Local Notice to Mariners, advising vessels to avoid potential hazards near survey areas. Furthermore, at least 21 days in advance of in-water activities, Permittees shall: (1) post such notices in the harbormasters' offices of regional harbors; and (2) notify operators of dive shops in coastal locations adjacent to the proposed offshore survey operations.	No adverse effects to recreational divers from survey operations.	Notify the USCG, local harbor-masters, and local dive shops of planned survey activity. Submit Final Monitoring Report after completion of survey activities.	OGPP permit holder.	Prior to survey.	

Mitigation Measure (MM)	Location and Scope of Mitigation	Effectiveness Criteria	Monitoring or Reporting Action	Responsible Party	Timing	Implementation Date(s) and Initials
MM FISH-1: U.S. Coast Guard (USCG) and Harbormaster Notification.	All California waters; as a survey permit condition, the CSLC shall require Permittees to provide the USCG with survey details, including information on vessel types, survey locations, times, contact information, and other details of activities that may pose a hazard to mariners and fishers so that USCG can include the information in the Local Notice to Mariners, advising vessels to avoid potential hazards near survey areas. Furthermore, at least 21 days in advance of in-water activities, Permittees shall post such notices in the harbormasters' offices of regional harbors.	No adverse effects to commercial fishing gear in place.	Notify the USCG and local harbor-masters of planned survey activity. Submit Final Monitoring Report after completion of survey activities.	OGPP permit holder.	Prior to survey.	1/17/14
MM FISH-2: Minimize Interaction with Fishing Gear.	To minimize interaction with fishing gear that may be present within a survey area: (1) the geophysical vessel (or designated vessel) shall traverse the proposed survey corridor prior to commencing survey operations to note and record the presence, type, and location of deployed fishing gear (i.e., buoys); (2) no survey lines within 30 m (100 ft) of observed fishing gear shall be conducted. The survey crew shall not remove or relocate any fishing gear; removal or relocation shall only be accomplished by the owner of the gear upon notification by the survey operator of the potential conflict.	No adverse effects to commercial fishing gear in place.	Visually observe the survey area for commercial fishing gear. Notify the gear owner and request relocation of gear outside survey area. Submit Final Monitoring Report after completion of survey activities.	OGPP permit holder.	Imme-diately prior to survey (prior to each survey day).	1/17/14
MM FISH-1: USCG and Harbormaster Notification.	Outlined under **Commercial and Recreational Fisheries** (above)					1/17/14

Acronyms/Abbreviations: CARB = California Air Resources Board; CDFW = California Department of Fish and Wildlife; CSLC = California State Lands Commission; cSEL = cumulative sound exposure level; dB = decibels; ft = feet; gal = gallon(s); LNM = Local Notice to Mariners; MPA = Marine Protected Area; MWCP = Marine Wildlife Contingency Plan; MWM = Marine Wildlife Monitor; m= meter(s); ms = millisecond(s); min = minute; NOAA = National Oceanic and Atmospheric Administration; NO_x = Nitrogen Oxide; OGPP = Offshore Geophysical Permit Program; OSCP = Oil Spill Contingency Plan; ppm = parts per million; lb = pound(s); rms = root mean square; SEL = sound exposure level; SPL = sound pressure level; USCG = U.S. Coast Guard